Computer Hardware Engineers

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What They Do

Computer Hardware Engineers research, design, develop, and test computer or computer-related equipment for commercial, industrial, military, or scientific use. They may supervise the manufacturing and installation of computer or computer-related equipment and components. Hardware refers to computer chips, circuit boards, computer systems, and related equipment, such as keyboards, modems, and printers. There are many areas of research in hardware development currently underway, such as "Neural Networks"—systems that mimic the behavior of the human brain and are used in robotics and medical diagnosis. The rapid advances in computer technology are largely a result of the research, development, and design efforts of Computer Hardware Engineers.

Tasks

- Analyze information to determine, recommend, and plan layout, including type of computers and peripheral equipment modifications.
- Analyze user needs and recommend appropriate hardware.
- Build, test and modify product prototypes, using working models or theoretical models constructed using computer simulation.
- Confer with engineering staff and consult specifications to evaluate interface between hardware and software and operational and performance requirements of overall system.
- Write detailed functional specifications that document the hardware development process and support hardware introduction.
- Design and develop computer hardware and support peripherals, including central processing units (CPUs), support logic, microprocessors, custom integrated circuits, printers, and disk drives.
- Evaluate factors such as reporting formats required, cost constraints, and need for security restrictions to determine hardware configuration.
- Monitor functioning of equipment and make necessary modifications to ensure system operates in conformance with specifications.
- Specify power supply requirements and configuration, drawing on system performance expectations and design specifications.
- Store, retrieve, and manipulate data for analysis of system capabilities and requirements.

*Detailed descriptions of this occupation may be found in the Occupational Information Network (O*NET) at online.onetcenter.org.*

EDD Employment Development Department State of California
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Computer Hardware Engineers

Important Skills, Knowledge, and Abilities

- Operations Analysis — Analyzing needs and product requirements to create a design.
- Mathematics — Using mathematics to solve problems.
- Science — Using scientific rules and methods to solve problems.
- Programming — Writing computer programs for various purposes.
- Troubleshooting — Determining causes of operating errors and deciding what to do about it.
- Active Learning — Understanding the implications of new information for both current and future problem-solving and decision-making.
- Speaking — Talking to others to convey information effectively.
- Critical Thinking — Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems.
- Computers and Electronics — Knowledge of circuit boards, processors, chips, electronic equipment, and computer hardware and software, including applications and programming.
- Engineering and Technology — Knowledge of the practical application of engineering science and technology. This includes applying principles, techniques, procedures, and equipment to the design and production of various goods and services.
- Design — Knowledge of design techniques, tools, and principles involved in production of precision technical plans, blueprints, drawings, and models.
- Written Comprehension — The ability to read and understand information and ideas presented in writing.
- Oral Comprehension — The ability to listen to and understand information and ideas presented through spoken words and sentences.
- Inductive Reasoning — The ability to combine pieces of information to form general rules or conclusions (includes finding a relationship among seemingly unrelated events).
- Deductive Reasoning — The ability to apply general rules to specific problems to produce answers that make sense.

Work Environment

Most Computer Hardware Engineers work in well-equipped offices and laboratories. They do much of their work at a computer workstation. They also spend much of their time in manufacturing and production departments observing the installation or testing of equipment. Computer Hardware Engineers work closely with other professionals and plant workers.

They generally work a standard 40-hour week. However, Computer Hardware Engineers may work evenings or weekends to meet deadlines for special projects or when troubleshooting technical difficulties.

Computer Hardware Engineers

California's Job Outlook and Wages

The California Outlook and Wage table below represents the occupation across all industries.

Standard Occupational Classification	Estimated Number of Workers 2004	Estimated Number of Workers 2014	Average Annual Openings	2006 Wage Range (per hour)
Computer Hardware Engineers				
17-2061	22,100	25,800	740	$35.63 to $55.94

Wages do not reflect self-employment.
***Average annual openings** include new jobs plus net replacements.*
Source: www.labormarketinfo.edd.ca.gov, Employment Projections by Occupation and OES Employment & Wages by Occupation, Labor Market Information Division, Employment Development Department.

Trends

The growth rate of Computer Hardware Engineer jobs is expected to be average compared with all occupations in the next few years. New jobs are expected in computer systems design, research and development, and employment (temporary) services industry sectors.

Although the use of information technology continues to expand rapidly, the manufacture of computer hardware is expected to be adversely affected by intense foreign competition. The utilization of foreign computer hardware engineering services also will serve to limit growth. The main source of job opportunities for this occupation will result from the need to replace workers who move into managerial positions, transfer to other occupations, or retire.

Training/Requirements/Apprenticeships

A bachelor of science degree in computer science, information science, or related fields such as electronics or aerospace engineering is essential to secure an entry-level position. Since there are continuing technological advances, Computer Hardware Engineers frequently go on to graduate school after obtaining their four year degree. Graduate degrees are sometimes required for certain jobs and to attain promotions. Computer Hardware Engineers must continue to study, either formally or informally, throughout their careers to keep up with the latest technologies.

There is no license required to work as a Computer Hardware Engineer in California. Many who earn degrees in electrical, electronic engineering, industrial, or aerospace engineering earn their Professional Engineers license by passing exams and becoming registered with the State of California, which can give them an advantage when competing for desirable jobs.

Recommended High School Course Work

High school students interested in this kind of work should take courses in computers, information technology, calculus and trigonometry, physical science, as well as electrical and electronic courses.

Where Do I Find the Job?

Many firms employing Computer Hardware Engineers recruit on college campuses in both the fall and spring prior to graduation. Advertisements of open positions appear in professional journals, trade magazines, newspapers, and on-line job banks. Employers and applicants use the employment services of professional societies, private employment agencies, armed services, and the Employment Development Department.

Computer Hardware Engineers

Use the *Search for Employers by Industry* feature on the *Career Center* page at www.labormarketinfo.edd.ca.gov to locate employers in your area. Search using keywords from the following manufacturing industry names to get a list of private firms and their addresses:

- Computer Storage Device
- Computer Systems Design Services
- Computer Terminal
- Custom Computer Programming
- Electronic Computer
- Industrial Process Variable Instrument
- Other Computer Peripheral Equipment
- Other Computer Related Services
- Physical/Engineering/Biological Research
- Social Science/Humanities Research

Search these **yellow page** headings for listings of private firms:

- Aircraft
- Computer Networks
- Computer Rooms, Installation & Equipment
- Computer Service & Repair
- Computer Wholesale and Manufacturers
- Engineers, Consulting
- Internet Equipment
- Telecommunications Installation & Repair
- Workstations & Servers

Where Can the Job Lead?

A career path for Computer Hardware Engineers might lead to supervisory or managerial positions within the Information Technology (IT) department of a firm, particularly for those who have high levels of communication and project management skills. Engineers with degrees in specialties such as electronics, aerospace, or industrial engineering will have many opportunities to make lateral moves into other departments and positions.

Other Sources of Information

Society of Manufacturing Engineers
www.sme.org

National Workforce Center for Emerging Technologies
www.nwcet.org

Association for Computing Machinery
www.acm.org

Institute for the Certification of Computing Professionals
www.iccp.org

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